The Effect of Hatha Yoga on Glucose Levels in Healthy College students

A project completed in partial fulfillment of the requirements for the Honors Program

by

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Abstract

Yoga is one of the most common forms of exercise practiced throughout the world. It has been demonstrated that yoga exercise can influence cortisol level, which plays a role in glucose production and regulation. **PURPOSE:** To determine the effects of six weeks of Hatha Yoga training on blood glucose levels in normal, healthy college-aged subjects. **METHODS:** Twenty subjects were randomly divided into one of two groups: 1) Hatha Yoga (HY; n=10) or 2) Control (CON; n=10). Blood glucose measurements were performed on each subject at week 0 (prior to training), week three, and week six (after training). Glucose measurements were determined using a commercially available glucometer (ACCU-Check). The HY group performed 15 minutes of Hatha yoga twice a week for six weeks. The CON group was asked to refrain from participating in new exercises or modifying current exercises to maintain blood glucose levels. Both groups were asked to keep a food log to track caloric intake. **RESULTS:** There was not a significant difference between the glucose measurements throughout the study. **CONCLUSION:** according to the results, yoga did not affect glucose levels of healthy individuals. **Key Words:** Hatha Yoga, Glucose Level, Healthy College Students.
Introduction

The Sanskrit word *yuj* is used as a base for the origin of the word Yoga, and it could be defined as unity (13). Based on this, yoga is stated as a technique of physical activities which would allow different moves together with breathing process to align the mind with the body (8, 16). The initial practitioners of yoga were ancient Indians and it has been 3000 years since this concept of yoga originated (2). Their main focus was to calm down the mind by exploring the environment in which human beings exist. Today, this central idea of yoga has shifted its focus to both the mind and body of humans (2). Yoga is also gaining considerable attention due to the potential health benefits through correlating the physical, mental and spiritual components (2).

Yoga has become one of the most dominant forms of exercises in the United States. This is supported by the fact that mostly 16 million Americans are practicing yoga (8). Nowadays, one can easily find yoga classes at a gym, in a place dedicated only for yoga, and even on the internet. The latter, especially will encourage Americans to do yoga, since they will be able to do it at any time and place. Besides these options, schools, work places and other media TV, health clubs are providing the positive aspect of yoga.

A study, made in the U.S. recently, shows the rapid rise and popularity of yoga in which a telephone survey was conducted of 2055 English speakers in the U.S. for one year. (7). The results showed that 7.5% of the subjects practiced yoga once during their lifetime while 3.8 % of them have practiced yoga in the year before the research was conducted (7).

There are various types of yoga some of which may be practiced by anyone, and others require higher strength. One of these, Ashtanga yoga is mainly practiced at schools which require more experiences and included poses that are changed in a faster pace. This type of yoga is usually practiced by students that are involved sports. Bikram yoga is another kind of yoga
which is also called hot yoga (16). This is because it takes place in a hottest room in which the temperature would be above 100 °F (16). Viniyoga is a form in which the poses are moderate and the learners should not necessarily be very active. Kundalini is a type of yoga that focuses on religious matters and also on a number of inhalation and exhalation processes (16).

Hatha yoga is the most common type of yoga which comprises poses that can be done by novices. The Stability, information and growth of the energies inside humans are the foundations of this type of yoga (13). According to this concept, there are three different elements included under this type of yoga. These are the breath, which is the connecting element, the physical and intellectual parts of humans. The different poses within the Hatha Yoga would be useful for these 3 elements by providing them with various breathing process, bodily moves and positions, and development of consciousness during this exercise (9).

As yoga gains in popularity, the debate as to the potential number of advantages has also garnered attention. Some of the proposed benefits of yoga range from improvements to the immune system reducing the viability of some diseases, to lowering blood pressure, heart rate, to elevated energy, and to improved cognitive function. People might develop self-confidence, better lifestyle, optimistic views, flexibility, social life, and patience towards other individuals (2).

In addition to the ones above, yoga has also been useful among people who have been struggling by problems which might affect their mental stability. Such problems include stress, depression and anxiety. These problems are capable of affecting the person both mentally and physically. Defects of some of the body systems could indicate disturbances inside the body. These defects will be projected by an increase in the level of various biological factors which can be eventually reduced by practicing yoga.
Cortisol is considered as one of the involved physiological factors. This hormone is a steroid hormone which is produced by the adrenal cortex, a part of the adrenal gland. Whenever the body is in danger, unexpected or stressful situations, this hormone is produced first by triggering the hypothalamus to produce a corticotropin-releasing factor, which causes the anterior pituitary to secrete adrenocorticotropin which finally stimulates the adrenal cortex to release cortisol (4). A number of studies have shown that cortisol levels increase when an individual faces some kind of trauma, or difficulty. These studies also indicated that the introduction of regular yoga practice to these individuals has shown a decreasing effect on the levels.

One of these studies investigated if yoga would be useful for breast cancer patients who were undergoing Adjuvant Radiotherapy. This was done by having a group of 88 breast cancer outpatients that were on stage II and III and divided in two groups; one group practicing Hatha yoga and the other performing some kind therapy for 6 weeks (1). The variables were salivary cortisol amount and two scales; one measured the patient’s anxiety and depression level while the other detected the impression they have for life. At the end, they found out that there was a decrease in both the cortisol levels and also the scales. So the conclusion for this study was that yoga did help the patients.

Glucose could be the other biological factor. Among the six important nutrients in our body, carbohydrates stand out. These come in the form of simple and complex sugars in which glucose is one of the simplest sugars. This biological factor is the main source of energy for the body and it can also be stored as reserve energy in the muscle and liver, where it is known as glycogen. The transformation of glucose into energy involves three steps: Glycolysis, Krebs cycle and Oxidative phosphorylation.
Glucose can be produced by the breakdown of glycogen which is called Glycogenolysis and also from other compounds like amino acids in the liver and kidneys through the process known as Gluconeogenesis (15). Both of these processes are needed when the glucose is low in the body. Cortisol plays an important role in the process of Gluconeogenesis and because of this, it is known as glucocorticoid (15). The necessary amounts of enzymes in the liver are retained by this hormone. This means the absence of cortisol will have huge impact for glucose production.

Based on the correlation between cortisol and glucose levels, yoga has an effect on glucose levels. Various studies have been done to see the effect of yoga on glucose levels. They have shown that glucose levels of those involved in the study would go down. Among these studies, there was one that looked at a total of 173 Chinese men and women over a 12-week period of time in order to recognize the influence of Hatha yoga on some of their physiological makers and other factors (12). Some of the subjects had metabolic syndrome while other don’t and there were two groups; control group which included subjects that did not do yoga and experimental group that did yoga. The physiological makers included triglycerides and fasting glucose levels. Based on the blood test they run, it was found that fasting glucose levels did drop down during this study. By the end of the study, the researchers of this study were able to show hatha yoga’s influence over glucose measurements.

A group of researchers performed another study that indicates the connection between yoga and glucose amount. The numbers of subjects were 60 which included both healthy and Type 2 Diabetic Mellitus patients and this study was done for 6 months (5). Measurements of the fasting glucose levels were taken at three different times during the entire period of the study; before the beginning of the yoga session, half-way through and at the end of the yoga session. The results of these measurements indicated that yoga would be benefiting Type 2 Diabetic
Patients by lowering their glucose amount.

There were also another group of subjects that studied the significance of yoga for Type 2 Diabetes Mellitus patients by having them do yoga for 5 weeks (3). 20 of these kinds of patients were the subjects whose glucose measurements were taken at the beginning and at the end of the study. This study was also able to find a decrease in the levels of glucose and concluded the importance of yoga in the life of Type 2 Diabetic patients.

The advantage of yoga for diabetic patients has also been inferred by an additional research. This research was accomplished over 45 days’ period having 60 patients Type 2 Diabetes (11). Half of these patients practiced Pranayamas and Yoga-Asanas which are different poses of hatha yoga together with some kind of medicine and the other half only took only the medicines. The measurements of the factors including fasting blood glucose level were taken as pre and post measurements. Due to the reduction in the fasting glucose levels and also other factors, the researchers determined the value of yoga for Diabetic patients.

As we can see on the studies discussed above, yoga does play a significant role on blood glucose levels in Diabetic patients. To our knowledge, there is very limited information on how yoga influences glucose levels in non-diabetic, healthy individuals. Therefore, the aim of this study is to determine the effects of yoga on glucose levels in non-diabetic college-aged students. We hypothesize that yoga training will decease resting glucose levels when compared to a control group. As a whole, the contribution of this study is to determine that individuals could practice yoga to maintain glucose levels and prevent themselves from getting Diabetics especially if this disease runs in the family.
Methods/Materials

Approximately 20 college students will participate in this study. Subjects will be randomly divided into one of the two groups: 1) Control (CON) and 2) Hatha Yoga (HY). All subjects will complete a medical history questionnaire and consent form approved by the Institutional Review Board Committee at Ohio Dominican University. Students in the HY group will be asked to practice Hatha Yoga twice a week for 15 minutes for six weeks. There would be ten poses that would be included in that Hatha Yoga and these poses together with the time length would be described below. Each student would be asked to pick two days and a convenient time throughout the week. Glucose levels of these students would be measured using a standard glucometer known as ACCU-CHEK Nano that is made in Vacaville, CA and finger prick with a standard lancet at multiple points throughout the training study. Glucose levels would be measured before and after every session of the Hatha Yoga.

Ten poses in the Hatha Yoga

1. Start with easy leg raises – 1 minute and 40 seconds
2. Simplified Sun Salutation (Surya Namaskar) – 3 minutes (Figure 2 included under this pose)
3. Child Pose (Balasana) – 1 minute (Refer Figure 1)
4. The Forward Bend (Paschimothanasana) – 1 minute and 30 seconds (Refer Figure 4)
5. The Bridge (Sethu Bandhasana) and the Wheel (Chakrasand) – 1 minute and 30 seconds (Refer 5)
6. Spinal Twist (Meru Wakrasana) – 1 minute & 30 seconds (Refer Figure 6)
7. Child’s Pose– 1 minute and 20 seconds
8. The Hands to Feet Pose – 1 minute & 30 seconds

9. Final Relation, Corpse Pose (Shavasana) – 1 minute

10. Rest - 1 minute

**Figures of some of the Poses**

*Figure 1 Child Pose (yoga magazine)*

*Figure 2 Cobra Pose (Find Home Remedy)*
Figure 3 Downward Dog Pose (Yoga Anonymous)

Figure 4 The Forward Bend Pose (TeluguOne)

Figure 5 The Bridge Pose (Fractal enlightenment)
Figure 6 The Spinal Twist Pose (Huff Post)

Results

Table 1.1 Means and Standard Deviation of glucose measurements at three different times for the Control Group

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Table 1.2 Means and Standard Deviation of glucose measurements at three different times for the Experimental Group

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Figure 1.1 Pre, Mid-way and Post Average and Standard deviation of Glucose Measurements of Control group.
Figure 1.2 Pre, Mid-way and Post Average and Standard deviation of Glucose Measurements of Experimental Group.

Figure 1.2 Comparison between Control and Experimental average glucose measurements.
Table 1.1 includes primary data of the subjects in the control group together with their average and standard deviation values that were conducted at the beginning, half way and at the end of the study. Figure 1.1 represents these averages of the glucose levels taken at three different times during the study.

Table 1.2 includes primary data of the subjects in the experimental group together with their average and standard deviation values that were conducted at the beginning of the sixth week, three weeks later and at the end of the sixth week. Figure 1.2 compares the averages of the pre, mid-way and post glucose levels of the subjects in the experiment group.

The comparison of averages between the control and experimental groups is described by Figure 1.2. The statistical test that was run for this study is known as Analysis of Variance (Anova). It was the two factors Anova test that was used for this study. The null hypothesis states that the means of all the three different times of glucose levels being the same while the alternative stating that there will be a difference among these measurements. Due to the fact that the p-value was not less than the alpha value (0.05 which indicates 95% confidence interval), the null hypothesis has been accepted. This means there was not any difference between the glucose levels.

Discussion

Based on the result, the hypothesis was not supported. Yoga did not really show a reducing effect on the glucose levels of healthy college students. This might have happened due to different aspects. One reason could be in contrast to other studies; this study was performed over a shorter period of time. When the study takes place for a longer period of time, it would be
possible to get more data on which we can get more information on that specific area of the study.

   Every person reacts differently towards a specific kind of exercise. This means each subject’s distinct response towards the yoga practice might have impacted the result. The source of this ability of individuals is the genetic differences between them and this concept is described under the principle of individuality (6). This can also be related to the idea of longer period of time since extending the time would allow the researcher to visualize how each subject responds and also how much of this difference in response will affect the research.

   The diet of the subjects might have influenced the result of this study. Even if, the subjects were told to maintain a consistent diet, some might have changed the amount of calories of the nutrients in their diet. It was not possible to get every subject’s biweekly calorie intake due to personal reasons. The time periods when meals are eaten with number of meals in one day could also affect the consistency of the diet.

   The kind of exercises the subjects performed during the study might have influenced yoga’s effect. The subjects were told to keep their exercise consistent without starting any new exercises during this study. Even though they kept it constant, the exercise that they have been doing might have a larger effect on glucose than yoga. This might come down to the adaptation ability.

   There was one study in which one researcher was interested to see the impact of yoga practices and other exercises on biological factors and hemoglobin level (10). A total of 90 students from an Art college were used as subjects for this research and these subjects were randomly assigned to control yoga and exercise group respectively. This study was done for 12 weeks and blood glucose was one of the biological factors which was measured before the two
groups started practicing and after they are done. In order to find if there is a difference between the two measurements, Anova test was used. It was found out that there was not a difference between the glucose amounts recorded at the beginning with the one at the end.

Throughout longer and difficult physical activity program the availability of water, energy and also glycogen would be limited. This means glucose levels will be low too. Even though this is what the normal outcome of that kind of exercise is, it is still possible to keep the water and glucose amount consistent by providing the body with the right amount of water and glucose. This was explained in the research as a reason for why there wasn’t a difference in the glucose levels.

As it is mentioned in the introduction section of this study, it has been shown by most studies like “Role of yoga in the management of Type 2 Diabetes Mellitus” that yoga does decrease the glucose levels of diabetic patients. The effectiveness of yoga might be different for healthy individuals when compared to diabetic patients. The reason for this can be explained by the physiological aspect of glucose. The hormone that is responsible for the consumption of glucose is insulin and the presence of glucose in the blood initiates the production of this hormone (15). When it comes to Type 2 Diabetic patients, the amount of insulin is low and also it would not be made even if glucose exists in the blood. This would result in a very high accumulation of glucose. According to this, yoga would be helpful to reduce glucose since the hormone that is responsible in the body could not accomplish its responsibility. However, the glucose levels in healthy individuals would be regulated by this hormone and kept in a normal range. So it might not be possible to see the impact of yoga in healthy individuals.
Conclusion

In this study, yoga did not decrease glucose levels of healthy college students. However, another research will be done in order to confirm yoga’s impact on glucose.
References


